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ABSTRACT

As a means of alleviating math anxiety among business students and of improving their business machine skills, Spokane Falls Community College offers a course in which basic business math skills are mastered through the use of desk top calculators. The self-paced course, which accommodates varying student skill levels, requires students to: (1) arithmetically solve business problems both with and without a calculator; (2) estimate answers, thereby improving self-confidence; (3) use a ten-key keyboard with touch control; (4) use the features provided on a variety of modern business electronic calculators; (5) use basic business math formulas; and (6) use the metric system. Course material is presented in a programmed text which provides frequent exercises for self-checking and requires students to devote an average of 50 hours to lab work. Because students learn to use a variety of calculators, the vocational relevance of the course is not endangered by the ongoing changes in computer technology. The course has proven to be successful on a number of counts: students give high ratings to the course and indicate that the programmed approach is neither boring nor overly time-consuming; the course is flexible enough to be used in a variety of on- and off-campus settings; and instructional costs have been minimized. The paper presents short answers to 15 questions concerning course management and equipment. (JP)

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COMBINING BASIC BUSINESS MATH AND ELECTRONIC CALCULATORS

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COMBINING BASIC BUSINESS MATH AND ELECTRONIC CALCULATORS

Obviously, a scanty background in mathematics will hold back students on engineering, economics or medicine. But a fear of math and a lack of basic skills can also prevent a person from entering the business world. People who suffer from "math anxiety"--a fear and hatred of mathematics--and those without proper machine skills are often unsuccessful in school and are forced into dead-end jobs.

In the winter quarter of 1977, the business department of Spokane Falls Community College solved the problem of math anxiety and more than tripled the enrollment of its business machines course by changing it to a new course that combines math and business machines applications.

In this new course, called Basic Business Math and Electronic Calculators, students use machines to learn mathematical concepts faster and more thoroughly than ever before. They work realistic business problems and are not held back by the drudgery of "pencil and paper" arithmetic computations. In the future, understanding the sophisticated calculator operations learned in this course may not only help these students keep their jobs, but will also help them advance faster.

A 40-year-old freshman who claims never to have had a successful experience with math said about the course, "I wish it were possible for it to be offered in junior high schools or even grade schools. Because of its simplicity, math has now become an enjoyable course for me."

Self-Paced Instruction

Since the material in the course is self-paced, students can skip over material they already know or spend as much time as they wish on any one area. Students who suffer from math anxiety or who have trouble conceptualizing basic arithmetic principles have the opportunity to start at the very beginning, if needed, and then build up their skills step by step with immediate positive reinforcement.

Before introducing the course, Spokane Falls Community College had only one five-credit business math class. As part of the business department, the teachers were concerned mainly with business examples and applications, and, in an attempt to meet student needs, each instructor taught the course differently.

Some students finished the course successfully and rated it as "most useful." Others would attend regularly and smile a lot for a "D" grade. But those who did not have an appropriate math background could pass only if they were tutored or spent considerable time in the instructor's office, and many students dropped out of the course completely. In some cases, instructors would spend the entire quarter teaching the basics of fractions, decimals and percents to the slower students, while holding back the more advanced students.

Wanting a better solution, we started giving every student entering a business math or machines class an arithmetic pretest. We then offered a two-track business math program with a basic class and an application class. But there were problems. Testing and advising took about one week of the students' time, and, as a result of the pretests, we labeled people.

Some students labeled "advanced" had gaps in their basic math skills, and some students labeled "slow" were just rusty, needing only a brief review of fundamentals. Students who needed help the most felt they were again labeled "dumb" and had one more reason to suffer from math anxiety. We also had the problem of offering a two-track program at low enrollment hours and in our evening and extension areas.

Course Objectives

The material for Basic Business Math and Electronic Calculators is designed to build on and review basic business math and electronic calculator skills. It is based on the premise that all business students need the ability to:

Work with addition, subtraction, multiplication and division to solve business problems, both with and without a calculator,
Estimate answers, therefore improving accuracy and self-confidence,
Use a ten-key keyboard with a "touch control,"
Use the special features found on most modern business electronic desk calculators,
Use basic business math formulas and
"Think metric."

The course objectives are not difficult, and each one usually takes only a few hours of the student's time, depending on his or her dexterity and ability to work with numbers. The average lab time without homework is about 50 hours, but this varies considerably. One student finished in less than 15 hours; others have taken more than 100 hours.

Students taking the Basic Business Math and Electronic Calculators course range from 18 to 60 years of age. They include people who have never experienced success in a math class and dislike anything dealing with numbers as well as people who have finished calculus and like it. The model group tends to be the students who want to review their ability to work with numbers and to learn job skills on a business calculator. The course seems to fit equally well in the day program and with adult students at night who are holding full time jobs during the day.

Basic Business Math and Electronic Calculators has been developed over a period of more than ten years of experience with the help of many instructors and thousands of students. Each frame of the course has been written, classroom-tested and then rewritten until it works. Each frame must communicate with students who have had trouble with the concept, and at the same time not seem redundant or boring to the fast learner.

Classes in adding machines and calculators have been changing rapidly within the past few years. They range from courses requiring orientation to outdated equipment to courses teaching students how to use only the newest programmable calculators. Some schools have dropped such courses--perhaps because of the frustrations of trying to keep up with the ever-changing calculator market, or because they feel that almost anyone can use an electronic calculator with little or no orientation.

But Basic Business Math and Electronic Calculators is unique in that it allows students to work with a wide variety of modern electronic calculators which reflect what the business community is using. The course text makes no attempt to picture the current model of a machine and therefore does not become obsolete with the first model change.

Instead, the student is directed to learn a specified operation from the text, the manufacturer's instruction manual or the instructor, and then perform several applications using the text. The text provides for self-paced, individualized instruction with frequent self-checking as reinforcement. Students take tests when they feel they are ready, and they are required to pass them. Instructor time may be used for individual attention, as needed.

During the program, students have successfully transferred from night school to day school, and from the central campus to extension centers.

High Marks for the Course

But do students like the course? Obviously, they must. Enrollment has tripled in our day classes relative to the conventional machine course. The demand for the course at night school, where many adults are taught, has increased to the point where the course is now scheduled four evenings a week and on Saturday mornings--instead of one course every other year. We now offer students open-entry/open-exit enrollment six days a week, and in the 1979-1980 school year, the Spokane Falls campus and our extension centers served about 1,000 students.

"I've taken a lot of math in college--calculus and finite math," said a 19-year-old accounting sophomore, "but this class combines the math and business applications. Anyone majoring in accounting needs this class, especially to learn to operate the calculator. I think it should be required for the A.A. degree in business."

Student evaluations show the overall program to rank in the 83rd percentile on relevant objectives and in the 90th percentile rank on examinations, compared with similar courses scored nationally by the IDEA system of faculty evaluation and improvement at Kansas State University.

One common complaint about programmed learning is that it is boring and too time-consuming. Yet in a sample of 373 students who completed the course, 80 percent felt that this was not true. Only 80 percent felt that this was not true. Only 3 percent said it was definitely too time-consuming. By a vast majority (88 percent), students felt the programmed approach was better than a conventional classroom. Only 2 percent said they would favor a conventional classroom. The remaining 10 percent were undecided.

Eighty-nine percent of the students said using calculators hepled them better understand the math concepts they were studying. Only 2 percent said the calculators did not help, nine percent had no opinion.

The program is flexible enough to have been used successfully at Spokane Falls Community College where day, night and weekend enrollment approached 1,000 students, and in a small prison extension center where enrollment was less than five students per class.

It has been used successfully where specialized facilities and staff were available, including student learning carrels, specialized instructors, paraprofessionals and student tutors. It has also been used where the only equipment was a calculator and the instructor had the assignment of teaching typing and other classes at the same time.

The only equipment really needed to teach the course is a single memory desk calculator for each student. The most popular ones with business are print display machines, since they are inexpensive, provide hard copies and have low repair costs. Security of the calculators should not be any more of a problem then with typewriters, since there are several good locking devices available for desk calculators.

Instructional costs in the daytime business math/machines program at Spokane Falls, where we use faculty, a paraprofessional and student tutors, are lower now than they were before we changed the course, even with our increased hours and enrollment. Where only low enrollments available, the program can still be offered efficiently and effectively.

At our extension centers in Colville, Washington, and at Fairchild Air Force Base, the Basic Business Math and Electronic Calculators program is used where different students in the same room are completing courses in typing, shorthand, transcription or other math programs with just one instructor present.

We normally like to use one instructor or paraprofessional plus one student tutor for each 10 to 15 students. Thus, 45 students in a given period could mean one instructor and three student tutors; 12 students may mean one paraprofessional and one student tutor.

After completing the new business math class, students at Spokane Falls Community College have the option of taking a variety of courses, including business math applications, real estate math, insurance math and an introduction to microcomputers. Whether or not students take these follow-up courses, though, Basic Business Math and Electronic Calculators has given them a new advantage in the job market: They now know the value of math and are confident in using it. They have shed their math anxiety.

(1) Q: Does it replace Business Math?
A: Yes and no, the course is designed to build and/or review basic business math skills. It meets the objectives of a basic business math class--objectives business advisory groups say are essential. It does not not preclude the option of teaching additional advanced or specialized business math classes. It helps to assure students have the prerequisite skills for an advanced or specialized course.

(2) Q: Doesn't the course require extra time or busy work for the student who already has basic arithmetic skills?
A: We have asked students this question, and they say it is definitely false. This book branches students around areas they already understand. The student is, however, required to pass all tests.

(3) Q: Wouldn't an audio-tutorial system be more effective than only a text?
A: We want students to work on business calculators that represent what they will find on the job. This goal requires the use of a variety of machines. Audio-tutorial systems require the use of only one type of calculator. With the rapid changes in the calculator market, we want maximum flexibility as well as a personal touch, which is provided by faculty and tutors. However, the text has been successfully supplemented with aids such as computer-directed instruction and video presentations.

(4) Q: What is a typical student profile?
A: Students range from 18 years of age to over 60. Students abilities and aptitudes range from those who have never experienced success in a math class and dislike anything dealing with numbers to people who have finished calculus and like it. The modal group tends to be the students who want to review the ability to work with numbers and to learn job skills on a business calculator. The course seems to fit equally well in the day program and with adult students at night who are holding full time jobs during the day.

(5) Q: Are there conflicts with math departments?
A: In some cases the math department may want to teach the course. In other schools the math department may not be meeting the needs of business students. Classes taught by the math department may contain subject matter seldom if ever used by the business world and problems not relevant to business. One business department changed the credit for their business machines course from 3 to 5 quarter hours. Now they have a student oriented basic business math course. A class specifically designed to offer a successful math experience to business students at the same time students gain job skills on a calculator.

(6) Q: What equipment is necessary?
A: The only required equipment is a single memory business desk calculator for each student. The most popular with businesses are print display machines. They are inexpensive and repair costs are low.

(7) Q: Why teach business desk calculators, don't most people use hand held calculators?

A: Desk calculators are very popular with business. The printout is a useful record. The keyboard is standard on more and more data processing terminals each year. Addition and subtraction can accomplished faster and with better accuracy than on a hand held unit. The problem solving procedure and the special features are often the same with a hand held or desk unit. Therefore, students gain better use of hand held calculators as well.

(8) Q: How do you sell BASIC BUSINESS MATH AND ELECTRONIC CALCULATORS to the administration?

A: Quality of the program, student achievement, student acceptance, low cost, and flexibility. Plus the opportunity to increase enrollment by serving more students. Utilization of resources mornings, afternoons and evenings during the regular school week and perhaps even weekends.

(9) Q: Are faculty willing to accept the change?

A: Some faculty may be reluctant to change. It is difficult for some teachers to move from a lecture to a lab mode. Most business department faculty, however, are concerned about student performance. When they find that more students have a better understanding of such basic business skills as percentage, decimals, and calculator operation they will endorse the program even if they may not want to teach it.

(10) Q: Why are students timed?

A: Students can use as much time as they desire to study the material for each test. Students are offered individual assistance. Students take tests only when they feel they are ready, however, performance is expected. Business expects tasks to be completed within a reasonable amount of time.

(11) Q: Should one person be in charge of the program?

A: Although several people may successfully teach in one program, one person should be given the <u>time</u> and <u>responsibility</u> to coordinate.

(12) Q: How many students can one instructor work with in a given hour?

A: We like to use one instructor or paraprofessional plus one student tutor for each 10 to 15 students: i.e. 45 students in a given period could mean one instructor and 3 student tutors, 12 students may mean one paraprofessional and 1 student tutor. To quote an Oregon Community College President, "Paraprofessionals and labs may not always be the most cost-efficient although they usually are. In some areas, however, they are always the most educationally effective."

(13) Q: Is a lab needed?

A: The text and supporting materials lend themselves well to a traditional classroom. A business lab, however, offers advantages. Flexibility in scheduling, more options for students, a substantial increase in enrollments plus the teaching advantage of one-to-one communication.

(14) Q: Does it replace the Business machines course?
A: Yes, it can replace any adding machine or calculator course and BASIC BUSINESS MATH AND ELECTRONIC CALCULATORS requires students to achieve basic job skills on equipment used in the business world today.

(15) Q: Will BASIC BUSINESS MATH AND ELECTRONIC CALCULATORS increase the use of the business machines room?
A: Yes, if the course is used in a traditional mode it will at least double the use of your calculators because of the addition of basic business math. If flexible scheduling and continuous enrollment is feasible, a machines room equipped with modern calculators can be utilized almost every hour your school is open with little or no change in facilities. This usage justifies the expenditures necessary to have up to date business calculators.

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